3.I - Agricultural: Other

Short description

Category Code	Name of Category	Method	AD	EF
3.I	Agriculture: other			
consisting of / including source categories:				
3.I	Storage of digestate from energy crops	T2 (NH_3, NO_x)	Q, PS	CS (NH_3, NO_x)

Method(s) applied	
D	Default
T1	Tier 1 / Simple Methodology *
T2	Tier 2*
T3	Tier 3 / Detailed Methodology *
C	CORINAIR
CS	Country Specific
M	Model
* as described in the EMEP/EEA Emission Inventory Guidebook - 2019, in category chapters.	
(source for) Activity Data	
NS	National Statistics
RS	Regional Statistics
IS	International Statistics
PS	Plant Specific
As	Associations, business organisations
Q	specific Questionnaires (or surveys)
M	Model / Modelled
C	Confidential
(source for) Emission Factors	
D	Default (EMEP Guidebook)
CS	Country Specific
PS	Plant Specific
M	Model / Modelled
C	Confidential

NO_x	NMVOC	SO_2	**NH_3**	$PM_{2.5}$	PM_{10}	TSP	BC	CO	Pb	Cd	Hg	As	Cr	Cu	Ni	Se	Zn	PCDD/F	B(a)P	B(b)F	B(k)F	I(x)P	PAH1-4	HCB	PCBs
-/-	NA	NA	-/-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

L/-	key source by **L**evel only
-/T	key source by **T**rend only
L/T	key source by both **L**evel and **T**rend
-/-	no key source for this pollutant
IE	emission of specific pollutant **I**ncluded **E**lsewhere (i.e. in another category)
NE	emission of specific pollutant **N**ot **E**stimated (yet)
NA	specific pollutant not emitted from this source or activity = **N**ot **A**pplicable
*	no analysis done

Country specifics

In 2024, NH_3 emissions from category 3.I (agriculture other) amounted to 0.26 % of total agricultural emissions, which is equal to ~ 1.3 kt NH_3. NO_x emissions from category 3.I contribute 0.07 % (~ 0.07 kt) to the total agricultural emissions. All these emissions originate from the storage of digestate from energy crops (for details on anaerobic digestion of energy crops see Vos et al. (2026)[1], Chapter 5.1. The emissions resulting from the application of energy crop digestates as organic fertilizer are dealt with under 3.D.a.2.c.

Activity Data

Time series of activity data have been provided by KTBL (Kuratorium für Technik und Bauwesen in der Landwirtschaft / Association for Technology and Structures in Agriculture). From these data the amount of N in energy crops fed into anaerobic digestion was calculated.

Table 1: N amount in energy crops fed into anaerobic digestion, in [kt N]

1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
0.0	0.6	5.3	45.1	163.0	293.7	292.2	287.4	283.2	283.2	289.3	283.8	304.9	295.3	295.3

Table 2: Distribution of gastight storage and storage in open tank of energy crop digestates, in [%]

	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
gastight	0.0	4.7	9.4	15.8	42.2	65.2	67.1	69.1	71.0	74.9	78.7	82.6	82.0	85.8	85.8
non-gastight	100	95.3	90.6	84.2	57.8	34.8	32.9	30.9	29.0	25.1	21.3	17.4	18.0	14.2	14.2

Methodology

The calculation of emissions from storage of digestate from energy crops considers two different types of storage, i.e. gastight storage and open tank. The frequencies of these storage types are also provided by KTBL (see Table 2). There are no emissions of NH_3 and NO from gastight storage of digestate. Hence the total emissions from the storage of digestate are calculated by multiplying the amount of N in the digestate leaving the fermenter with the relative frequency of open tanks and the emission factor for open tank. The amount of N in the digestate leaving the fermenter is identical to the N amount in energy crops fed into anaerobic digestion (see Table 1) because N losses from pre-storage are negligible and there are no N losses from fermenter (see Vos et al. 2026, Chapter 5.1).

Emission factors

As no specific emission factor is known for the storage of digestion residues in open tanks, the NH_3 emission factor for storage of cattle slurry with crust in open tanks was adopted (0.045 kg NH_3 -N per kg TAN). This choice of emission factor is based on the fact that energy crops are, in general, co-fermented with animal manures (i. e. mostly slurry) and that a natural crust forms on the liquid digestates due to the relatively high dry matter content of the energy crops.

The TAN content after the digestion process is 0.56 kg TAN per kg N. The NO emission factor for storage of digestion residues in open tanks was set to 0.0005 kg NO-N per kg N.

The following table shows the resulting implied emission factors for NH_3 -N and NO-N. NO_x emissions are related to NO-N emissions by the ratio of 46/14. This relationship also holds for NO-N and NO_x emission factors.

Table 3: IEF for NH_3 -N and NO-N emissions from storage of digested energy crops

1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
IEF in kg NH_3-N per kg N in digested energy crops														
0.0252	0.0240	0.0228	0.0212	0.0146	0.0087	0.0082	0.0078	0.0073	0.0063	0.0054	0.0044	0.0045	0.0036	0.0036
IEF in kg NO-N per kg N in digested energy crops														
0.00050	0.00048	0.00045	0.00042	0.00029	0.00017	0.00016	0.00015	0.00014	0.00013	0.00011	0.00009	0.00009	0.00007	0.00007

Trend discussion for Key Sources

NH_3 and NO_x from storage of anaerobically digested energy crops are no key source.

Recalculations

There were no recalculations except the replacement of extrapolated activity data in 2023 with data from KTBL (see main page of the agricultural sector, Chapter 5 - NFR 3 - Agriculture (OVERVIEW), **recalculation No. 18**). For further details on recalculations see Vos et al. (2026), Chapter 1.3.

Table 4: Comparison of NH_3 and NO_x emissions [kt] with previous submission

	Submission	1990	1995	2000	2005	2010	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Ammonia	**current**	0.0015	0.0180	0.1482	1.1624	2.8842	3.1074	2.9181	2.7131	2.5068	2.1785	1.8901	1.5115	1.6749	1.2796	1.2796
	previous	0.0015	0.0180	0.1482	1.1624	2.8842	3.1074	2.9181	2.7131	2.5068	2.1785	1.8901	1.5115	1.6749	1.6749	
	absolute change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.40	
	relative change [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-23.60	
Nitrogen oxides	**current**	0.0001	0.0010	0.0080	0.0624	0.1548	0.1668	0.1567	0.1457	0.1346	0.1170	0.1015	0.0811	0.0899	0.0687	0.0687
	previous	0.0001	0.0010	0.0080	0.0624	0.1548	0.1668	0.1567	0.1457	0.1346	0.1170	0.1015	0.0811	0.0899	0.0899	
	absolute change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.02	
	relative change [%]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-23.60	

For **pollutant-specific information on recalculated emission estimates for Base Year and 2023**, please see the tables following chapter 9.1 - Recalculations.

Planned improvements

At the moment, no category-specific improvements are planned.

Uncertainty

Details are described in chapter 1.7.

[1]
Vos, C., Rösemann, C., Haenel, H.-D., Dämmgen, U., Döring, U., Wulf, S., Eurich-Menden, B., Döhler, H., Steuer, B., Osterburg, B., Fuß,R. (2026) Calculations of gaseous and particulate emissions from German agriculture 1990 – 2024 : Report on methods and data (RMD) Submission 2026. www.eminv-agriculture.de